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(54) Title of the Utility Model: POLISHING INSPECTION DEVICE IN WAFER POLISHING APPARATUS

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Specification

1. Title of the Utility Model

POLISHING INSPECTION DEVICE IN WAFER POLISHING APPARATUS

2. Claims of Utility Model

(1) A polishing inspection device in a wafer polishing apparatus consisting of a fixed table having a polishing cloth stretched over the top surface thereof, and a holder for pressing a wafer against the polishing cloth of said fixed table, while rotating the wafer, the device being characterized in that an inspection hole facing the polishing surface of said wafer is provided in said fixed table and polishing cloth, and a projecting optical fiber for illuminating the polishing surface of said wafer with light and a receiving optical fiber for receiving the reflected light from the polishing surface of said wafer are inserted into the inspection hole.

3. Detailed Description of the Utility Model

[Field of Industrial Application]

The present utility model relates to a device for inspecting the polishing progress state of the wafer in a wafer polishing apparatus for polishing the surface of wafers used in the manufacture of semiconductor chips.

[Related Technology and Problems the Utility Model Aims to Address]

It is well known that in the conventional wafer polishing apparatuses, a polishing cloth is stretched over the top surface of a fixed table, a polishing liquid is supplied to the polishing cloth, a wafer that is the object of polishing is mounted on the lower surface of a rotary holder, and the surface of the wafer is pressed against the polishing cloth stretched over the fixed table, while the wafer is rotated, thereby polishing the surface of the wafer. With such a structure of conventional wafer polishing apparatuses, the polishing progress state on the wafer surface cannot be determined during polishing operation.

For this reason, in order to inspect whether the wafer surface has been polished to the prescribed level, the following procedure was employed. The polishing process was conducted for an appropriate time, then the rotation of the holder was stopped and it was removed from the fixed table to inspect the polishing progress state on the wafer surface with the naked eye or with a microscope. When the polishing was found to be insufficient, it was resumed and conducted for an appropriate time and then again the inspection was conducted with the naked eye or microscopic observations. Therefore, before the wafer surface was polished to a smooth surface, the operation of pressing the wafer against the fixed table with a holder and polishing, while rotating the wafer, and the operation of terminating the rotation of the holder, removing it from the fixed table, and inspecting the wafer surface with the naked eye or with a microscope were alternately repeated. This procedure greatly decreased the operation efficiency of polishing and increased significantly the cost of polishing.

It is in object of the present utility model to increase the operation efficiency of polishing by providing a device suitable for rapidly inspecting the polishing progress state on the wafer surface, without detaching the holder from the fixed table.

[Means to Resolve the Problems]

In order to attain the aforementioned object, the present utility model provides for a wafer polishing apparatus comprising a fixed table having a polishing cloth stretched over the top surface thereof, and a holder for pressing a wafer against the polishing cloth at the fixed table, while rotating the wafer, the device being characterized in that an inspection hole facing the polishing surface of the wafer is provided in the fixed table and polishing cloth, and a projecting optical fiber for illuminating the polishing surface of the wafer with light and a receiving optical fiber for reflecting the reflected light from the polishing surface of the wafer are inserted in the inspection hole.

[Operation and Effect of the Utility Model]

In the above-described configuration, if the rotation of the holder is terminated and the polishing surface of the wafer is illuminated with light from a projecting optical fiber, this light will be reflected by the polishing surface of the wafer and the reflected light will be received by the receiving optical fiber.

In this case, the light that is reflected by the polishing surface of the wafer has a low intensity at the initial stage of polishing, but the intensity thereof increases as the surface becomes smooth in the course of polishing. Therefore, the polishing progress state of the wafer can be detected based on the reflected light that is received by the aforementioned receiving optical fiber. As a result, when the polishing state is inspected, the aforementioned conventional operation of terminating the rotation of the holder, removing the holder from the fixed table, and observing the polishing surface of the wafer with the naked eye or with a microscope can be omitted.

Therefore, with the present utility model, the operation efficiency of substrate polishing can be greatly improved and the polishing cost can be substantially reduced.

[Embodiments]

An embodiment of the present utility model will be described herein below with reference to the appended drawings. In the drawings, the reference numeral 1 stands for a fixed table having a polishing cloth 2 stretched over the top surface thereof. The reference numeral 3 stands for a holder that is so provided above the fixed table 1 that the holder can move in the vertical direction. A wafer 4 is fixedly attached to the lower surface of the holder with a wax 5 or by vacuum suction. The wafer is rotated while being pressed against the polishing cloth 2 located at the top surface of the fixed table 1. When the holder 3 is rotated, the surface of the wafer 4 is brushed against the polishing cloth 2 and polished.

A plurality of drain holes 6 are provided in the fixed table 1 in order to drain the polishing liquid supplied to the polishing cloth 2 located at the top surface of the fixed table. Drain tubes 7 for the polishing liquid are connected to these drain holes 6.

The reference numeral 8 stands for an inspection cable containing inside thereof two optical fibers: a projecting optical fiber 9 and a receiving optical fiber 10. One end of the inspection cable 8 is detachably connected to the drain tube 7, and the projecting optical fiber 9 and receiving optical fiber 10 located inside the cable are inserted into the drain hole 6 so that the light projected by the projecting optical fiber 9 onto the surface of the wafer 4 is reflected by the surface of the wafer 4 and received by the receiving optical fiber 10. The other end of the inspection cable 8 is connected to the inspection circuit 11 consisting of a light-emitting element 12, such as a laser, corresponding to the projecting optical fiber 9, and a photoelement 13 corresponding to the receiving optical fiber 10.

The connection portion of the aforementioned inspection cable 8 in the drain tube 7 for the polishing liquid is so constructed that when the inspection cable 8 is not connected to the connection portion, the connection portion is closed with a lid (not shown in the figures).

The light emitted by the light-emitting element 12 in the inspection circuit 11 illuminates, via the projecting optical fiber 9, the surface of the wafer 4, which is pressed by the holder 3 against the polishing cloth 2 at the fixed table 1, and the reflected light is received via the receiving optical fiber 10 by the photolement 13 located in the inspection circuit 11.

In this case, the light reflected from the surface of the wafer 4 has a low intensity at the initial stage of polishing, that is, when the surface of the wafer 4 is rough, and increases gradually as the surface of the wafer 4 becomes smooth in the course of polishing. Therefore, the polishing progress state, that is, the smoothness of the surface of the wafer 4 can be detected based on the output of the photoelement 13.

Further, this embodiment described a case in which one of the drain holes 6 was used as an inspection hole by inserting the projecting optical fiber 9 and receiving optical fiber 10 into one drain hole 6 of a plurality of drain holes 6 provided in the fixed table 1. However, the inspection hole for inserting the projecting optical fiber 9 and receiving optical fiber 10 may be also provided separately from the drain hole 6. Furthermore, when a hole for supplying the polishing liquid is provided in the fixed table 1, this polishing liquid supply hole also may be used as the inspection hole for inserting the projecting optical fiber 9 and receiving optical fiber 10.

4. Brief Description of the Drawings

The appended figures illustrate an embodiment of the present utility model. FIG. 1 is a front view and FIG. 2 is an enlarged cross-sectional view of the main part shown in FIG. 1.

1 – fixed table; 2 – polishing cloth; 3 – holder; 4 – wafer; 6 – drain hole; 8 – inspection cable; 9 – projecting optical fiber; 10 – receiving optical fiber; 11 – inspection circuit; 12 – light-emitting element; 13 – photoelement.

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Figure 1
[see original for diagram]

Figure 2
[see original for diagram]

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Certificate of Accuracy

This is to certify that the attached document, Patent H2-86128, Public Utility Model Disclosure Bulletin (U), originally written in Japanese, is, to the best of our knowledge and belief, true, accurate and complete translation into English.

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Merrill Corporation

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No. 01TH6047313
Qualified in Queens County
Certificate filed in New York County
Commission Expires August 28, 2006

Sworn to and signed before
Me this 29th day of
April, 2004

Notary Public